

IN THE CLAIMS:

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1.-13. (Cancelled)

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14. (Currently amended) An independent ignition type ignition coil for an internal combustion engine which is ~~used after being inserted~~ insertable into a plug hole in the internal combustion engine and having a portion capable of being directly coupled to a corresponding ignition plug and ~~of which portion being inserted into the plug hole has~~ having an outer diameter of 18mm ~ 27mm, and ~~which includes~~ comprising a center core, a secondary coil wound around a secondary coil bobbin and a primary coil wound around a primary coil bobbin arranged concentrically in a coil casing in ~~this~~ the foregoing order from the inside of the coil casing and an insulation use resin filled between the constituting members in the coil casing,

wherein, between the primary coil bobbin and the primary coil and/or between layers of the primary coil a an unoccupied gap portion ~~which reduces is~~ is formed between a surface of primary coil wire material and the insulation resin to reduce a stress component caused inside the secondary coil bobbin due to a thermal contraction difference of the primary coil and the secondary coil bobbin among thermal stress caused inside the secondary coil bobbin ~~is coexisted with the insulation use resin,~~

~~wherein the gap portion is formed between the surface of wire material of the primary coil and the insulation use resin.~~

15. (Currently amended) An independent ignition type ignition coil for an internal combustion engine which is ~~used after being inserted~~ insertable into a plug hole in the internal combustion engine and having a portion capable of being directly coupled to a corresponding ignition plug and ~~of which portion being inserted into the plug hole has~~ having an outer diameter of 18mm ~ 27mm, and which includes comprising a center core, a secondary coil wound around a secondary coil bobbin and a primary coil wound around a primary coil bobbin arranged concentrically in a coil casing in ~~this~~ the foregoing order from the inside of the coil casing and an insulation use resin filled between the constituting members in the coil casing, ~~characterized in that~~ wherein the secondary coil bobbin is constituted by a denatured PPE containing an inorganic filler material in an amount of not less than 20 weight % and, between the primary coil bobbin and the primary coil and/or between layers of the primary coil a , an unoccupied gap portion which reduces is formed between a surface of primary coil wire material and the insulation resin to reduce a stress component caused inside the secondary coil bobbin due to thermal contraction difference of the primary coil and the secondary coil bobbin among thermal stress caused inside the secondary coil bobbin ~~is coexisted with the insulation use resin, formed between the surface of wire material of the primary coil and the insulation use resin.~~

16. (Currently amended) An independent ignition type ignition coil for an internal combustion engine which is ~~used after~~ capable of being directly coupled to a corresponding ignition plug, ~~and which includes~~ comprising a center

core, a secondary coil wound around a secondary coil bobbin and a primary coil wound around a primary coil bobbin arranged concentrically in a coil casing in ~~this~~ the foregoing order from ~~the~~ inside of the coil casing and an insulation use resin filled between the constituting members in the coil casing,

wherein, between the primary coil bobbin and the primary coil and/or between layers of the primary coil a , an unoccupied gap portion which reduces is formed between the primary coil wire material and the insulation resin to reduce a stress component cause inside the secondary coil bobbin due to thermal contraction difference of the primary coil and the secondary coil bobbin among thermal stress caused inside the secondary coil bobbin ~~is coexisted with the insulation use resin, formed between the surface of wire material of the primary coil and said insulation use resin.~~

17. (Previously added) An ignition coil for an internal combustion engine according to claim 14, wherein a bobbin axial direction of the secondary coil bobbin corresponds to a resin flowing direction during molding of the resin, and an average linear expansion coefficient of the secondary coil bobbin in orthogonal direction with respect to the resin flowing direction is  $35\sim 75 \times 10^{-6}$  at temperatures  $-30^{\circ}\sim 10^{\circ}$  according to a testing method conforming to ASTM D696.

18. (Previously added) An ignition coil for an internal combustion engine according to claim 15, wherein a bobbin axial direction of the secondary coil bobbin corresponds to a resin flowing direction during molding of the resin, and an average linear expansion coefficient of the secondary coil bobbin in

orthogonal direction with respect to the resin flowing direction is  $35\sim 75\times 10^{-6}$  at temperatures  $-30^{\circ}\sim 10^{\circ}$  according to a testing method conforming to ASTM D696.

19. (Previously added) An ignition coil for an internal combustion engine according to claim 16, wherein a bobbin axial direction of the secondary coil bobbin corresponds to a resin flowing direction during molding of the resin, and an average linear expansion coefficient of the secondary coil bobbin in orthogonal direction with respect to the resin flowing direction is  $35\sim 75\times 10^{-6}$  at temperatures  $-30^{\circ}\sim 10^{\circ}$  according to a testing method conforming to ASTM D696.

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20. (Currently amended) An independent ignition type ignition coil for an internal combustion engine which is ~~used after being inserted~~ insertable into a plug hole in the internal combustion engine and having a portion capable of being directly coupled to a corresponding ignition plug and ~~of which portion being inserted into the plug hole has~~ having an outer diameter of 18mm ~ 27mm, ~~and which includes~~ comprising a center core, a secondary coil wound around a secondary coil bobbin and a primary coil wound around a primary coil bobbin arranged concentrically in a coil casing in ~~this~~ the foregoing order from the inside ~~of~~ the coil casing and an insulation ~~use~~ resin filled between the constituting members in the coil casing,

wherein, between the primary coil bobbin and the primary coil and/or between layers of the primary coil a , an unoccupied gap portion which reduces is formed between a surface of the primary coil and the insulation resin to reduce a stress component caused inside the secondary coil bobbin due to thermal

contraction difference of the primary coil and the secondary coil bobbin among thermal stress caused inside the secondary coil bobbin is ~~coexisted with the insulation use resin,~~

~~wherein the gap portion is formed between the surface of the primary coil and the insulation use resin,~~

wherein a bobbin axial direction of the secondary coil bobbin corresponds to a resin flowing direction during molding of the resin, and an average linear expansion coefficient of the secondary coil bobbin in orthogonal direction with respect to the resin flowing direction is  $35 \sim 75 \times 10^{-6}$  at temperatures  $-30^{\circ}$ - $10^{\circ}$  according to a testing method conforming to ASTM D696.

21. (Currently amended) An independent ignition type ignition coil for an internal combustion engine which is ~~used after being inserted~~ insertable into a plug hole in the internal combustion engine and having a portion capable of being directly coupled to a corresponding ignition plug ~~and of which portion being inserted into the plug hole has~~ and having an outer diameter of 18mm ~ 27mm, ~~and which includes~~ comprising a center core, a secondary coil wound around a secondary coil bobbin and a primary coil wound around a primary coil bobbin arranged concentrically in a coil casing in ~~this~~ the foregoing order from ~~the inside of the coil casing and an insulation use resin filled between the~~ constituting members in the coil casing, wherein

the secondary coil bobbin is constituted by a denatured PPE containing an inorganic filler material in an amount of not less than 20 weight % and, between the primary coil bobbin and the primary coil and/or between layers of the

primary coil a , an unoccupied gap portion which reduces is formed between a surface of the primary coil and the insulation resin to reduce a stress component caused inside the secondary coil bobbin due to thermal contraction difference of the primary coil and the secondary coil bobbin among thermal stress caused inside the secondary coil bobbin is coexisted with the insulation use resin,

~~wherein the gap portion is formed between the surface of the primary coil and the insulation use resin, and~~

~~wherein~~ a bobbin axial direction of the secondary coil bobbin corresponds to a resin flowing direction during molding of the resin, and an average linear expansion coefficient of the secondary coil bobbin in orthogonal direction with respect to the resin flowing direction is  $35 \sim 75 \times 10^{-6}$  at temperatures  $-30^{\circ}$ - $10^{\circ}$  according to a testing method conforming to ASTM D696.

22. (Currently amended) An independent ignition type ignition coil for an internal combustion engine which is ~~used after~~ capable of being directly coupled to a corresponding ignition plug, ~~and which includes~~ comprising a center core, a secondary coil wound around a secondary coil bobbin and a primary coil wound around a primary coil bobbin arranged concentrically in a coil casing in ~~this the foregoing~~ order from the inside of the coil casing and an insulation use resin filled between the constituting members in the coil casing,

wherein, between the primary coil bobbin and the primary coil and/or between layers of the primary coil a , an unoccupied gap portion which reduces is formed between a surface of the primary coil and the insulation resin to reduce a stress component cause inside the secondary coil bobbin due to thermal

contraction difference of the primary coil and the secondary coil bobbin among thermal stress caused inside the secondary coil bobbin ~~is coexisted with the insulation use resin,~~

~~wherein the gap portion is formed between the surface of the primary coil and the insulation use resin.~~

23. (Previously added) An independent ignition type ignition coil for an internal combustion engine which is used after being directly coupled to a corresponding ignition plug, and which includes a center core, a secondary coil wound around a secondary coil bobbin and a primary coil wound around a primary coil bobbin arranged concentrically in a coil casing in this order from the inside of the coil casing and an insulation use resin filled between the constituting members in the coil casing, characterized in that on a side of bobbin surfaces of the primary coil bobbin on which the primary coil is wound a cover film or a cover coating which facilitates peeling off of the insulation use resin around the bobbin surface from the bobbin surface,

wherein the secondary coil bobbin is constituted by 45 weight % ~ 60 weight % of denatured PPE, 15 weight % ~ 25 weight % of glass fiber and 15 weight % ~ 35 weight % of inorganic filler material in a non-fiber shape.

24. (Currently amended) An independent ignition type ignition coil for an internal combustion engine which is ~~used after~~ capable of being directly coupled to a corresponding ignition plug, ~~and which includes~~ comprising a center core, a secondary coil wound around a secondary coil bobbin and a primary coil

wound around a primary coil bobbin arranged concentrically in a coil casing in ~~this~~ the foregoing order from ~~the~~ inside of the coil casing and an insulation use resin filled between the constituting members in the coil casing,

wherein, on a side of bobbin surfaces of the primary coil bobbin on which the primary coil is wound, a cover film or a cover coating ~~which facilitates~~ is arranged to facilitate peeling off of the insulation use resin around the bobbin surface from the bobbin surface,

wherein a bobbin axial direction of the secondary coil bobbin corresponds to a resin flowing direction during molding of the resin, and an average linear expansion coefficient of the secondary coil bobbin in orthogonal direction with respect to the resin flowing direction is  $35\sim75\times10^{-6}$  at temperatures  $-30^{\circ}\sim10^{\circ}$  according to a testing method conforming to ASTM D696.

25. (Previously added) An independent ignition type ignition coil for an internal combustion engine which is used after being inserted into a plug hole in the internal combustion engine and being directly coupled to a corresponding ignition plug and of which portion being inserted into the plug hole has an outer diameter of 18mm ~ 27mm, and which includes a center core, a secondary coil wound around a secondary coil bobbin and a primary coil wound around a primary coil bobbin arranged concentrically in a coil casing in this order from the inside of the coil casing and an insulation use resin filled between the constituting members in the coil casing,

wherein between the primary coil bobbin and the primary coil and/or between layers of the primary coil a gap portion which reduces a stress



component caused inside the secondary coil bobbin due to thermal contraction difference of the primary coil and the secondary coil bobbin among thermal stress caused inside the secondary coil bobbin is coexisted with the insulation use resin,

wherein the gap portion is formed between the surface of wire material of the primary coil and the insulation use resin,

wherein the secondary coil bobbin is constituted by 45 weight % ~ 60 weight % of denatured PPE, 15 weight % ~ 25 weight % of glass fiber and 15 weight % ~ 35 weight % of inorganic filler material in a non-fiber shape,

wherein a cover film or a cover coating applied on a side of bobbin surfaces of said primary coil on which the primary coil is wounded is a material having a small adhesion to the insulation use resin filled around said primary coil.

26. (Currently amended) An independent ignition type ignition coil for an internal combustion engine which is ~~used after being inserted~~ insertable into a plug hole in the internal combustion engine and having a portion capable of being directly coupled to a corresponding ignition plug ~~and of which portion by~~ being inserted into the plug hole ~~has~~ and having an outer diameter of 18mm ~ 27mm, ~~and which includes~~ comprising a center core, a secondary coil wound around a secondary coil bobbin and a primary coil wound around a primary coil bobbin arranged concentrically in a coil casing in ~~this~~ the foregoing order from ~~the inside of~~ the coil casing and an insulation use resin filled between the constituting members in the coil casing,

wherein, between the primary coil bobbin and the primary coil and/or between layers of the primary coil a , an unoccupied gap portion which reduces is

formed between a surface of primary coil wire material and the insulation resin  
to reduce a stress component caused inside the secondary coil bobbin due to  
thermal contraction difference of the primary coil and the secondary coil bobbin  
among thermal stress caused inside the secondary coil bobbin ~~is coexisted with~~  
~~the insulation use resin,~~

~~wherein the gap portion is formed between the surface of wire material of~~  
~~the primary coil and the insulation use resin,~~

wherein a bobbin axial direction of the secondary coil bobbin corresponds  
to a resin flowing direction during molding of the resin, and an average linear  
expansion coefficient of the secondary coil bobbin in orthogonal direction with  
respect to the resin flowing direction is  $35 \sim 75 \times 10^{-6}$  at temperatures  $-30^{\circ}$ - $10^{\circ}$   
according to a testing method conforming to ASTM D696,

wherein a cover film or a cover coating applied on a side of bobbin surfaces  
of said primary coil on which the primary coil is wounded is a material having a  
small adhesion to the insulation use resin filled around said primary coil.

27. (Currently amended) An independent ignition type ignition coil for  
an internal combustion engine which is ~~used after being inserted~~ insertable into  
a plug hole in the internal combustion engine and having a portion capable of  
being directly coupled to a corresponding ignition plug ~~and of which portion by~~  
being inserted into the plug hole, which portion has an outer diameter of 18mm ~  
27mm, ~~and which includes~~ comprising a center core, a secondary coil wound  
around a secondary coil bobbin and a primary coil wound around a primary coil  
bobbin arranged concentrically in a coil casing in ~~this~~ the foregoing order from

the inside of the coil casing and an insulation use resin filled between the constituting members in the coil casing,

wherein, between the primary coil bobbin and the primary coil and/or between layers of the primary coil, a gap portion which reduces a stress component caused inside the secondary coil bobbin due to thermal contraction difference of the primary coil and the secondary coil bobbin among thermal stress caused inside the secondary coil bobbin is coexisted with the insulation use resin,

wherein the gap portion is formed between the surface of wire material of the primary coil and the insulation use resin; and

wherein the secondary coil bobbin is constituted by 45 weight % ~ 60 weight % of denatured PPE, 15 weight % ~ 25 weight % of glass fiber and 15 weight % ~ 35 weight % of inorganic filler material in a non-fiber shape,

wherein a material of the cover film or the cover coating is an insulation material containing one of nylon, polyethylene and ~~Teflon~~ PTFE.

28. (Currently amended) An independent ignition type ignition coil for an internal combustion engine which is used after being inserted into a plug hole in the internal combustion engine and being directly coupled to a corresponding ignition plug and of which portion being inserted into the plug hole has an outer diameter of 18mm ~ 27mm, and which includes a center core, a secondary coil wound around a secondary coil bobbin and a primary coil wound around a primary coil bobbin arranged concentrically in a coil casing in this order from the inside of the coil casing and an insulation use resin filled between the constituting members in the coil casing,

wherein between the primary coil bobbin and the primary coil and/or between layers of the primary coil a gap portion which reduces a stress component caused inside the secondary coil bobbin due to thermal contraction difference of the primary coil and the secondary coil bobbin among thermal stress caused inside the secondary coil bobbin is coexisted with the insulation use resin,

wherein the gap portion is formed between the surface of wire material of the primary coil and the insulation use resin; and

wherein a bobbin axial direction of the secondary coil bobbin corresponds to a resin flowing direction during molding of the resin, and an average linear expansion coefficient of the secondary coil bobbin in orthogonal direction with respect to the resin flowing direction is  $35\sim75\times10^{-6}$  at temperatures  $-30^{\circ}\sim10^{\circ}$  according to a testing method conforming to ASTM D696,

wherein a material of the cover film or the cover coating is an insulation material containing one of nylon, polyethylene and ~~Teflon~~ PTFE.

29. (Previously added) An independent ignition type ignition coil for an internal combustion engine which is used after being inserted into a plug hole in the internal combustion engine and being directly coupled to a corresponding ignition plug and of which portion being inserted into the plug hole has an outer diameter of 18mm ~ 27mm, and which includes a center core, a secondary coil wound around a secondary coil bobbin and a primary coil wound around a primary coil bobbin arranged concentrically in a coil casing in this order from the inside of the coil casing and an insulation use resin filled between the constituting members in the coil casing,

wherein between the primary coil bobbin and the primary coil and/or between layers of the primary coil a gap portion which reduces a stress component caused inside the secondary coil bobbin due to thermal contraction difference of the primary coil and the secondary coil bobbin among thermal stress caused inside the secondary coil bobbin is coexisted with the insulation use resin,

wherein the gap portion is formed between the surface of wire material of the primary coil and the insulation use resin,

wherein the secondary coil bobbin is constituted by 45 weight % ~ 60 weight % of denatured PPE, 15 weight % ~ 25 weight % of glass fiber and 15 weight % ~ 35 weight % of inorganic filler material in a non-fiber shape,

E<sup>3</sup> wherein the primary coil bobbin is constituted by a polybutylene terephthalate containing a rubber.

30. (Currently amended) An independent ignition type ignition coil for an internal combustion engine which is ~~used after being inserted~~ insertable into a plug hole in the internal combustion engine and having a portion capable of being directly coupled to a corresponding ignition plug ~~and of which portion by~~ being inserted into the plug hole, which portion has an outer diameter of 18mm ~ 27mm, ~~and which includes~~ comprising a center core, a secondary coil wound around a secondary coil bobbin and a primary coil wound around a primary coil bobbin arranged concentrically in a coil casing in ~~this~~ the foregoing order from the inside of the coil casing and an insulation use resin filled between the constituting members in the coil casing,

wherein, between the primary coil bobbin and the primary coil and/or between layers of the primary coil a , an unoccupied gap portion which reduces is formed between a surface of primary coil wire material and the insulation resin to reduce a stress component caused inside the secondary coil bobbin due to thermal contraction difference of the primary coil and the secondary coil bobbin among thermal stress caused inside the secondary coil bobbin is coexisted with the insulation use resin, wherein the gap portion is formed between the surface of wire material o said primary coil and said insulation use resin; and ,

wherein a bobbin axial direction of the secondary coil bobbin corresponds to a resin flowing direction during molding of the resin, and an average linear expansion coefficient of the secondary coil bobbin in orthogonal direction with respect to the resin flowing direction is  $35\sim75\times10^{-6}$  at temperatures  $-30^{\circ}\sim10^{\circ}$  according to a testing method conforming to ASTM D696, and

wherein the primary coil bobbin is constituted by a polybutylene terephthalate containing a rubber.

31. (Previously added) An independent ignition type ignition coil for an internal combustion engine which is used after being inserted into a plug hole in the internal combustion engine and being directly coupled to a corresponding ignition plug and of which portion being inserted into the plug hole has an outer diameter of 18mm ~ 27mm, and which includes a center core, a secondary coil wound around a secondary coil bobbin and a primary coil wound around a primary coil bobbin arranged concentrically in a coil casing in this order from the inside of the coil casing and an insulation use resin filled between the

constituting members in the coil casing, wherein between the primary coil bobbin and the primary coil and/or between layers of the primary coil a gap portion which reduces a stress component caused inside the secondary coil bobbin due to thermal contraction difference of the primary coil and the secondary coil bobbin among thermal stress caused inside the secondary coil bobbin is coexisted with the insulation use resin,

wherein the gap portion is formed between the surface of wire material of the primary coil and the insulation use resin,

wherein the secondary coil bobbin is constituted by 45 weight % ~ 60 weight % of denatured PPE, 15 weight % ~ 25 weight % of glass fiber and 15 weight % ~ 35 weight % of inorganic filler material in a non-fiber shape,

wherein the center core is coated with an insulation material having an elasticity before being disposed inside the secondary coil bobbin, and after the coated center core is disposed in the secondary coil bobbin a hard epoxy resin is filled between the center core and the secondary coil bobbin.

32. (Currently amended) An independent ignition type ignition coil for an internal combustion engine which is ~~used after being inserted~~ insertable into a plug hole in the internal combustion engine and has a portion capable of being directly coupled to a corresponding ignition plug ~~and of which portion~~ by being inserted into the plug hole, which portion has an outer diameter of 18mm ~ 27mm, ~~and which includes~~ comprising a center core, a secondary coil wound around a secondary coil bobbin and a primary coil wound around a primary coil bobbin arranged concentrically in a coil casing in ~~this~~ the foregoing order from

the inside of the coil casing and an insulation use resin filled between the constituting members in the coil casing,

wherein, between the primary coil bobbin and the primary coil and/or between layers of the primary coil a , an unoccupied gap portion which reduces is formed between a surface of primary coil wire material and the insulation resin to reduce a stress component caused inside the secondary coil bobbin due to thermal contraction difference of the primary coil and the secondary coil bobbin among thermal stress caused inside the secondary coil bobbin ~~is coexisted with the insulation use resin,~~

~~wherein the gap portion is formed between the surface of wire material of the primary coil and the insulation use resin,~~

E<sup>3</sup> wherein a bobbin axial direction of the secondary coil bobbin corresponds to a resin flowing direction during molding of the resin, and an average linear expansion coefficient of the secondary coil bobbin in orthogonal direction with respect to the resin flowing direction is  $35\sim75\times10^{-6}$  at temperatures  $-30^{\circ}\sim10^{\circ}$  according to a testing method conforming to ASTM D696, and

~~wherein~~ the center core is coated with an insulation material having an elasticity before being disposed inside the secondary coil bobbin, and a hard epoxy resin is filled between the center core and secondary coil bobbin after the coated center core is disposed in the secondary coil bobbin ~~a hard epoxy resin is filled between the center core and the secondary coil bobbin.~~

33. (Currently amended) An independent ignition coil for an internal combustion engine which is insertable into a plug hold in the internal



combustion engine and having a portion capable of being directly coupleable to a corresponding ignition plug and ~~of which portion being~~ inserted into the plug hole, which portion has an outer diameter of 18 mm ~ 27 mm, and ~~which includes~~ a center core, a secondary coil wound around a secondary coil bobbin and a primary coil wound around a primary coil bobbin arranged concentrically in a coil casing in the foregoing order as constituting members from inside the coil casing and an insulation [-use] resin filled between the constituting members in the coil casing,

wherein, between at least one of the primary coil bobbin and the primary coil, and layers of the primary coil, ~~a~~ an unoccupied gap portion which reduces is formed by a peeling off between of a surface of primary coil wire material and the insulation resin to reduce a stress component caused inside the secondary coil bobbin due to a thermal contraction difference of the primary coil and the secondary coil bobbin ~~coexists with the insulation use resin,~~

~~wherein the gap portion is formed by peeling off between the surface of wire material of the primary coil and the insulation use resin.~~

34. (Currently amended) An independent ignition coil for an internal combustion engine directly coupleable to a corresponding ignition plug, and which includes a center core, a secondary ~~soil~~ coil wound around a secondary coil bobbin and a primary coil wound around a primary coil bobbin arranged concentrically in a coil casing in the foregoing order as constituting members from inside the coil casing and an insulation [-use] resin filled between the constituting members in the coil casing,

wherein, between at least one of the primary coil bobbin and the primary coil, and layers of the primary coil, ~~a~~ an unoccupied gap portion which reduces is formed by peeling off between a surface of primary coil wire material and the insulation resin to reduce a stress component caused inside the secondary coil bobbin due to a thermal contraction difference of the primary coil and the secondary coil bobbin ~~coexists with the insulation use resin, formed by peeling off between the surface of wire material of the primary coil and said insulation use resin.~~

E<sup>3</sup>  
35. (Currently amended) An independent ignition coil for an internal combustion engine directly coupleable to a corresponding ignition plug, and which includes a center core, a secondary coil wound around a secondary coil bobbin and a primary coil wound around a primary coil bobbin arranged concentrically in a coil casing in the foregoing order as constituting members from inside the coil casing and an insulation [-use] resin filled between the constituting members in the coil casing,

wherein, between at least one of the primary coil bobbin and the primary coil, and layers of the primary coil, ~~a~~ an unoccupied gap portion which reduces is formed by peeling off between a primary coil surface and the insulation resin to reduce a stress component caused inside the secondary coil bobbin due to a thermal contraction difference of the primary coil and the secondary coil bobbin ~~coexists with the insulation use resin,~~

~~wherein the gap portion is formed by peeling off between the surface of the primary coil and the insulation use resin.~~